

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B65H 16/10	A1	(11) International Publication Number: WO 96/33120 (43) International Publication Date: 24 October 1996 (24.10.96)
--	-----------	--

(21) International Application Number: PCT/IT96/00074

(22) International Filing Date: 16 April 1996 (16.04.96)

(30) Priority Data:
FI95U000044 21 April 1995 (21.04.95) IT

(71) Applicant (for all designated States except US): FABIO PERINI S.P.A. [IT/IT]; Via per Mugnano, I-55100 Lucca (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): BIAGIOTTI, Guglielmo [IT/IT]; Via di Vorno, 105, I-55012 Capannori (IT).

(74) Agents: MANNUCCI, Gianfranco et al.; Via della Scala, 4, I-50123 Firenze (IT).

(81) Designated States: AM, AU, AZ, BB, BG, BR, BY, CA, CN, CZ, EE, GE, HU, IS, JP, KG, KP, KR, KZ, LK, LR, LT, LV, MD, MG, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

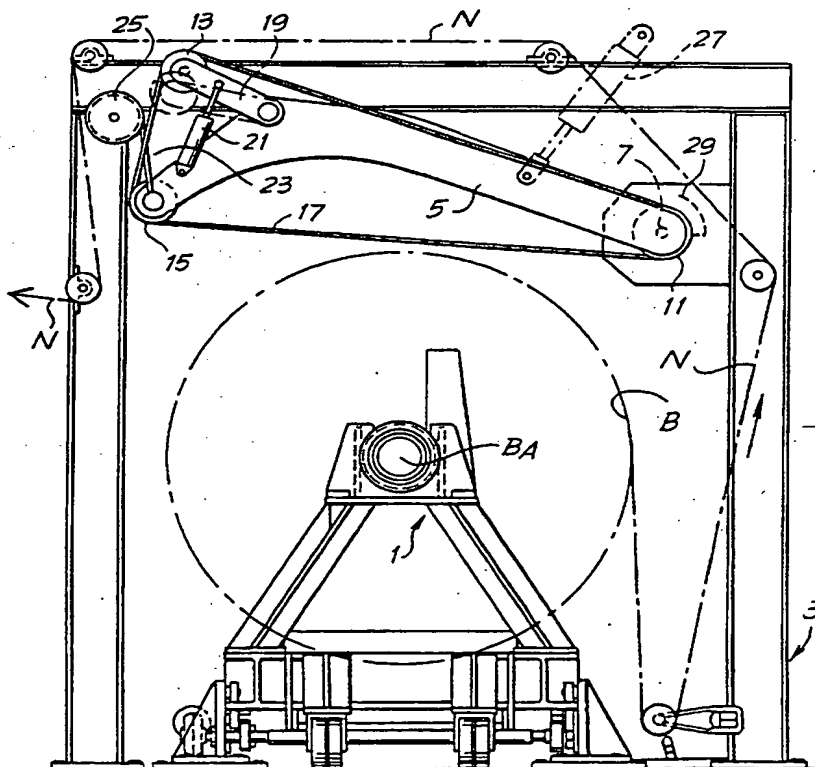
Published

With international search report.

(54) Title: DEVICE FOR UNWINDING REELS OF WEB MATERIAL COMPRISING A SYSTEM FOR CONTROLLING THE UNWINDING PRESSURE

(57) Abstract

A device is described for unwinding a reel of web material in order to feed said material to a processing section, comprising a support (1) for the reel (B), an unwinding member and an actuator (21) which applies a pressure on the reel, causing said unwinding member to press thereon; means are also provided for adjusting the pressure applied to the reel via said unwinding member (17) as a function of the diameter of the reel being unwound, the pressure being reduced as the diameter decreases.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

"Device for unwinding reels of web material comprising a system for controlling the unwinding pressure"

Description

Technical Field

The invention relates to a device for unwinding reels of web material in order to feed said material to a processing section, comprising a support for said reels, an unwinding member driven at a controlled speed, and an actuator which causes said unwinding member to press against the reel being unwound.

Background Art

Unwinding devices of this type are commonly used in paper processing lines, in which a reel of large diameter is formed into reels of smaller diameter, equal to the diameter of the finished product, which are then cut perpendicularly to their axis to produce rolls of toilet paper, kitchen towels and similar products.

Usually, the unwinding member in these unwinding devices is an endless flexible member that travels around a plurality of pulleys, at least one of which is motorized. The pulleys are carried by a movable arm to which is attached the actuator which causes one part of the flexible member to press against the outer surface of the reel. Typically, the flexible member is a belt or a plurality of belts. However, it is quite possible for the unwinding member to take a different form, for example a rotating cylinder. In such a case, said rotating cylinder can still be carried by a movable arm which is operated by the actuator.

The diameter of the reels varies greatly during operation, from the starting diameter (2000-3000mm) down to the diameter of the inner tubular core (about 80-450mm). The pressure exerted by the unwinding member must be carefully gaged in order to prevent it exceeding the strength limits of the reel as the latter's diameter

decreases, especially when the force exerted by the unwinding device is added to the weight of the reel, that is to say when the unwinding device presses on the reel from above. If the reel were to break during the operating phase, this would cause a considerable loss in production and loss of raw materials, and would pose a great danger to personnel. On the other hand, too low a pressure would give rise to difficulties in controlling the unwinding action during the initial phase and during changes in speed.

Summary of the invention

The subject of the present invention is an unwinding device of the type indicated at the outset that makes it possible to avoid the risk of incorrectly gaging the unwinding pressure applied to the reel and makes it easier to set the device, ensuring correct operation with reels of any diameter and at any stage of the unwinding cycle.

Basically, these and other objects and advantages - which will be quite evident to those skilled in the art on reading the following description - are achieved by providing, in combination with the unwinding device, means for adjusting the pressure applied to the reel via said flexible member as a function of the diameter of the reel being unwound, the pressure being reduced as the diameter decreases.

A means for detecting the diameter of the core is preferably provided. However, this is not strictly necessary, as will be explained below. If this detection means is present, it could take the form of a position transducer which detects the position of the movable arm carrying said pulleys for deflecting the flexible member.

In a way known per se, said movable arm may carry an actuator that keeps said flexible member taut while the movable arm is moved step-wise (that is to say in an intermittent manner) toward the axis of the reel, as

the latter is unwound, and each time said actuator has reached a predetermined position.

Brief Description of the Drawings

The drawing shows one possible embodiment of the invention. In the drawing :

Fig. 1 shows a side view of the unwinding device; and

Fig. 2 shows a graph of the pressure on the reel as a function of its diameter.

Detailed Disclosure of the Invention

The unwinding device comprises a support 1 for the reel B of web material N which is unwound and fed to a processing line (not shown). A housing 3 carries a movable arm 5 which is hinged at 7 about a stationary horizontal axis so that it can rotate toward the axis BA of the reel B. The movable arm 5 carries three pulleys 11, 13, 15, at least one of which (for example the pulley 11) is motorized. Travelling around the pulleys 11, 13, 15 is a flexible member consisting of a belt 17 which is brought into contact with the cylindrical surface of the reel B and pressed against it in order to exert the pressure required to unwind it.

One of the deflection pulleys of the belt 17, pulley 13 in the example illustrated, is carried by a smaller auxiliary arm 19 to which is attached a cylinder and piston actuator 21, for the purposes detailed below.

The movable arm 5 is held in its angular position by a cable 23 and a pulley block 25 or by a cylinder and piston actuator 27 or by other equivalent means designed to move the movable arm 5 downward at predetermined instants, so as to follow the reduction in diameter of the reel B.

In order to unwind the reel B, the movable arm 5 is lowered with respect to the position it occupies in Fig. 1, until the belt 17 comes into contact with the

outer surface of the reel B over a sufficiently extensive arc, and exerting a sufficiently high pressure, to ensure that enough frictional force is exerted on the reel to cause it to rotate. The belt 17 is kept taut by the cylinder and piston system 21. By rotating the belt 17 the reel is also made to rotate and the web material N is gradually fed to the processing line downstream. This causes a gradual reduction in the diameter of the reel B and hence an extension of the cylinder and piston 21 - which constitutes an elastic system - with a consequent clockwise swinging movement of the smaller auxiliary arm 19, thereby tending to recover the slack in the belt 17.

Once the smaller auxiliary arm 19 has reached an end-of-travel position, for example determined by a position transducer, the actuator 27 or the system 25 designed to lower the movable arm 5 by rotating it counterclockwise about the axis 7, is operated. This once again involves compressing the cylinder and piston system 21.

Attached to the movable arm 5 is a position transducer consisting, for example, of an encoder or of a series of proximity sensors 29 which enable the angular position of the arm 5 to be detected and hence an approximate indication of the diameter of the reel B to be given.

During operation, at the beginning of the reel B unwinding cycle, said reel has a large diameter and therefore a large cross section. The belt 17 is pulled very taut by means of the cylinder and piston actuator 21 and therefore a large pressure is applied to the surface of the reel. As the diameter of the reel B decreases and the movable arm 5 is lowered in order to follow the variation in the diameter by rotating around the axis 7, the tension in the belt 17 and thus the pressure on the reel B are reduced. The reduction may be a linear one or may be defined in some other way. Fig. 2 shows a graph illustrating the pressure exerted on the reel B as a

function of the diameter of the reel. Three different, alternative curves are shown: (a), (b) and (c). The graph is continuous, from a maximum pressure value P_{max} , corresponding to the maximum diameter D_{max} , to a minimum pressure value P_{min} , corresponding to the minimum diameter D_{min} . In practice, when an arrangement of the type shown in Fig. 1 is used, with an actuator 21 that takes up the slack in the belt 17 and a movable arm 5 that is lowered intermittently by means of the actuator 27 or the pulley block 25, the pressure exerted on the reel is discontinuous, but the situation is analogous in terms of concept: the pressure is gradually reduced as the diameter of the reel B decreases.

Rather than using a transducer to detect the position of the movable arm 5, means may be used which detect the actual diameter of the reel directly.

As an alternative, and given that the movable arm 5 preferably has an intermittent lowering movement, it is even possible to dispense with the position transducer altogether and vary the pressure on the reel as a function of the number of lowering movements effected by the arm 5, assuming the diameter of the reel is reduced by a known amount each time the arm is lowered.

Instead of detecting the position of the arm 5 using a transducer and therefore adjusting the pressure as a function of the signal from said transducer, the arm 5 can be provided with a cam profile that directly controls a proportional valve with a rod. In this way, as the arm 5 rotates it directly causes a variation in the pressure.

As the reel is unwound, it may be necessary to slow down the speed at which the web material is fed out, for example as a result of the re-winding device downstream being slowed down. In such cases it is necessary to brake the reel. In order to ensure efficient braking, it is possible for the pressure exerted by the unwinding member (for example the flexible member 17) to be temporarily increased, for example by a fixed

percentage value, during the braking action and to be then once again reduced and brought back to the operating value determined by the diameter of the reel.

Claims

1. A device for unwinding a reel of web material in order to feed said material to a processing section, comprising a support (1) for the reel (B), an unwinding member and an actuator (21) which applies a pressure on the reel, causing said unwinding member to press thereon, characterized by means for adjusting the pressure applied to the reel via said unwinding member (17) as a function of the diameter of the reel being unwound, the pressure being reduced as the diameter decreases.

2. The unwinding device as claimed in claim 1, characterized in that said unwinding member comprises an endless flexible member (17) that travels around a plurality of pulleys (11, 13, 15) carried by a movable arm (5), at least one of which pulleys is motorized, said actuator (21) causing one part of said flexible member (17) to press against said reel (B).

3. The unwinding device as claimed in claim 1 or 2, characterized in that it comprises a detection means (29) for detecting the diameter of the reel.

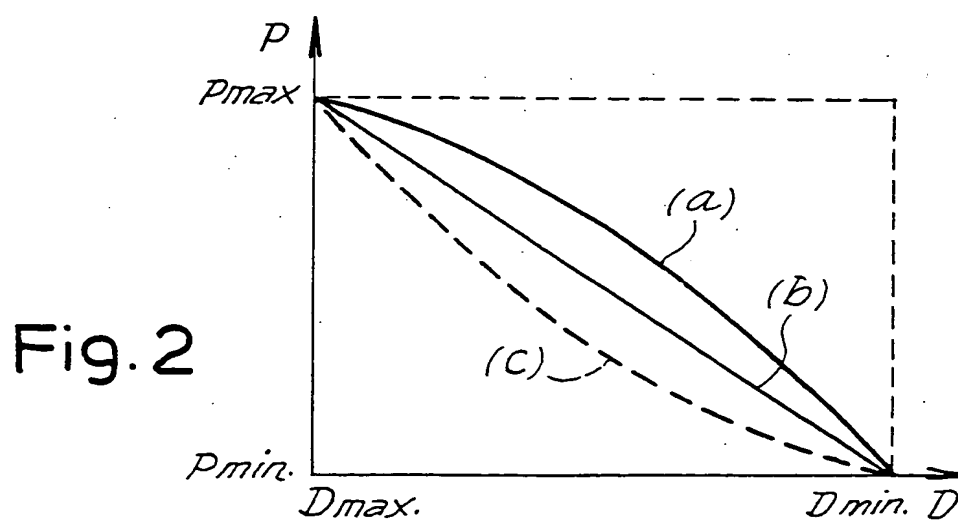
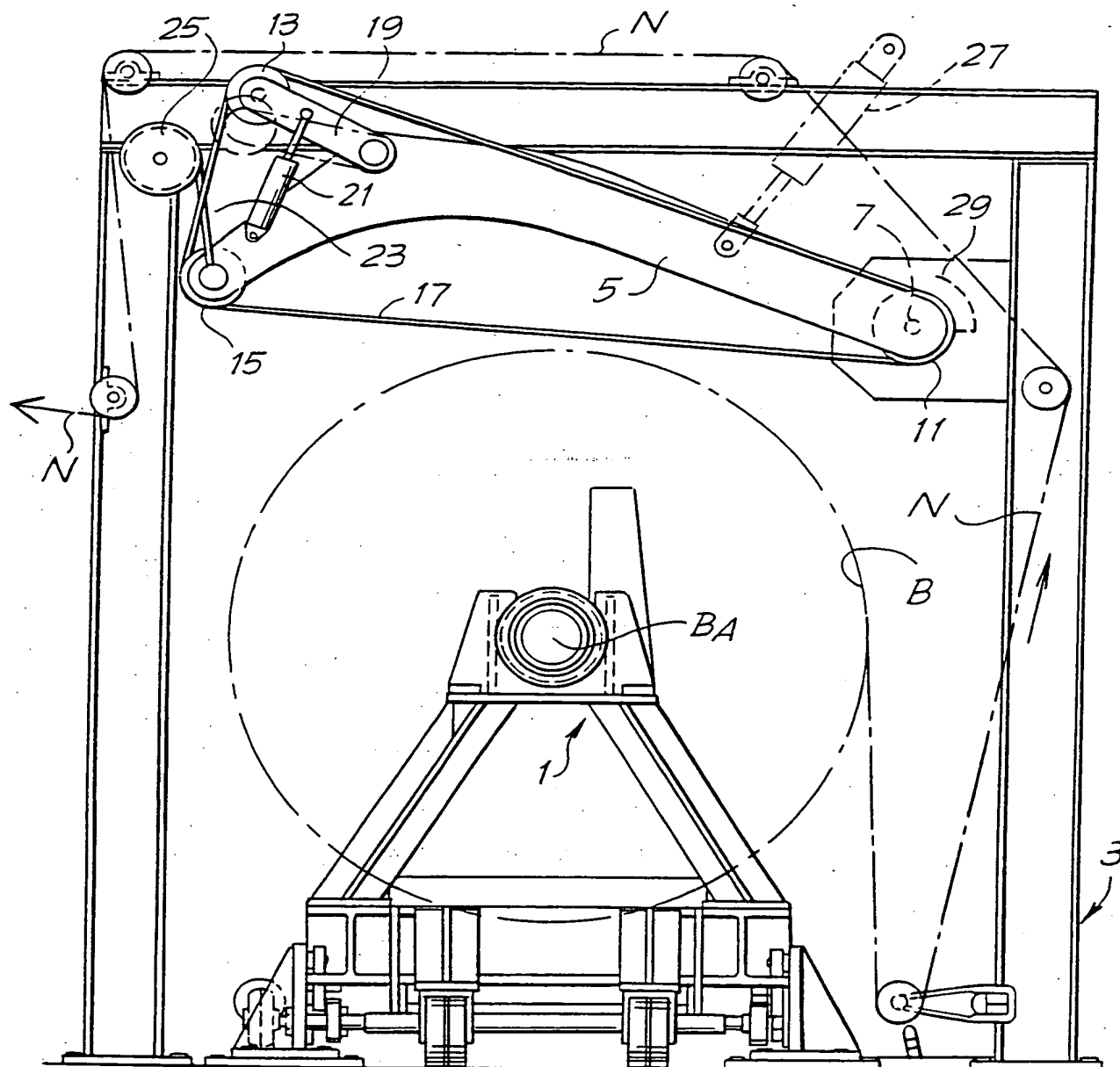
4. The unwinding device as claimed in claim 3, characterized in that the unwinding member (17) is carried by a movable arm (5) and the detection means is a position sensor that detects the position of said movable arm (5).

5. The unwinding device as claimed in claim 2, characterized by comprising an actuator (21) which is carried by said movable arm (5) and keeps said flexible member (17) taut, and wherein said movable arm (5) is moved step-wise toward the axis (BA) of the reel (B), as said reel is unwound, and each time said actuator (21) has reached a predetermined position.

6. The unwinding device as claimed in claim 5, characterized in that said actuator (21) is a cylinder and piston system that acts on a smaller auxiliary arm (19) carrying one of said deflection pulleys (13), which pulley (13) can move with respect to the other deflection pulleys carried by said movable arm (5).

7. The unwinding device as claimed in claim 1, characterized in that said unwinding member (17) is carried by a movable arm (5) and wherein a cam profile is provided on said movable arm and acts on a pressurizing fluid control valve in order to adjust the pressure applied on the reel as a direct function of the position of said movable arm.

8. The unwinding device as claimed in one or more of the preceding claims, characterized in that said means for adjusting the pressure applied to the reel increase the pressure exerted during the reel braking phases.



INTERNATIONAL SEARCH REPORT

Inter. Application No.
PCT 96/00074

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB,A,793 937 (FR. HESSER MASCHINENFABRIK AG.) 23 April 1958 see the whole document ---	1,2,5
A	DE,C,445 034 (VOGTLÄNDISCHE MASCHINENFABRIK AG.) 26 January 1926 see the whole document ---	1,2
A	US,A,5 326 041 (ALEXANDER, III ET AL) 5 July 1994 see the whole document -----	3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PAT 96/00074

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-321887	28-06-89	US-A- 4893763	16-01-90
		CA-A- 1337822	26-12-95
		DE-D- 3884586	04-11-93
		DE-T- 3884586	17-02-94
		JP-A- 2144356	04-06-90
		US-A- 5472153	05-12-95
		US-A- 5000394	19-03-91
		US-A- 5344089	06-09-94
		US-A- 5156350	20-10-92

DE-B-1088339		NONE	

US-A-3989201	02-11-76	NONE	

US-A-4883233	28-11-89	AT-B- 400328	27-12-95
		AT-A- 122888	15-04-95
		DE-A- 3816777	08-12-88

GB-A-793937		NONE	

DE-C-445034		NONE	

US-A-5326041	05-07-94	NONE	

47

This Page Blank (uspto)